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## Lab project addresses global warming

By Jonathan Weisman  
STAFF WRITER

LIVERMORE — Sandia National Laboratories scientists this month are orchestrating a high-altitude pirouette above the prairie, using three airplanes, a spy satellite and a battery of land instruments to fill critical gaps in our understanding of global warming.

The exercise, unfolding above Oklahoma and Kansas, seeks to discover how increasing cloud cover could offset or exacerbate the effects of excess carbon dioxide in the atmosphere.

"Cloudy skies are complicated. We don't have an accurate understanding of what really happens" in the sky, explained Sandia's John Vitko, director of the project.

Clouds have long been the wild card in the debate over global warming, the Livermore resident said. Most scientists expect that increasing amounts of carbon dioxide — largely from the burning of fossil fuels — will raise the Earth's temperatures by trapping heat that would have escaped into space.

But that same carbon dioxide is likely to also increase the planet's cloud cover. That could cool things down by blocking out the sun, or it could make global warming even worse by trapping more heat at ground level.

Making things even more complicated are new calculations that estimate as much as 50 percent more solar energy is being

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## Warming: Scientists to use bush plane in air study

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absorbed by cloud cover as scientists previously thought, said Francisco Valero, an atmospheric scientist at the Scripps Institute of Oceanography in San Diego. That means less heat is escaping into space. More heat trapped in the atmosphere can lead to anything from higher winds and more powerful storms to melting polar ice caps.

"Carbon dioxide might increase the surface temperatures, which would increase atmospheric temperatures, which would increase clouds, which absorb more energy," Valero said. "You start chaos. There's consequence after consequence after consequence."

To understand this process, Sandia scientists are flying a bush plane, a twin-engined Otter, below the clouds at 1,500 feet. Directly overhead, but 43,000 feet up, an Egrett spy plane is collecting scientific data in and above the clouds. Both planes are piled high with instrumentation, some made by Sandia and Lawrence Livermore National Laboratory scientists originally for defense applications.

"The trick is to keep them aligned," Vitko said. "They're separated by seven or eight miles of atmosphere."

Still higher, at 65,000 feet, soars a NASA ER-2, similar to the U-2 spy plane. At 100,000 feet, weather satellites transmit information from above the atmosphere. And the Department of Energy's Cloud and Radiation Testbed, stretching from Oklahoma to Kansas, is taking weather readings at ground level.

The data pouring in from up to 100 hours of flight time should give scientists real information on how much of the sun's heat is absorbed into clouds at all altitudes. Over the next year, that information will be plugged into complex computer models to more accurately predict the effect of greenhouse gases like carbon dioxide on global temperatures, Vitko said.

"It's like election returns coming in," he said. "You get excited about it. You get sucked in."

The project, which costs about \$1 million a year, is part of an array of global warming research efforts under attack in Washington, where some congressmen have labeled it "liberal claptrap." Vitko, who will be in Oklahoma the whole month, defended his work even as he acknowledged tight federal budgets.

"We need a prudent, long-term investment to understand what's going on in our world," he said.